

## REMARKS

In the Office Action, claims 19-37 are rejected under 35 U.S.C. §102 or §103. Applicants believe that the rejections are improper based on at least the reasons set forth below.

More specifically, the Patent Office alleges the claims 19, 20, 22, 23, 24, 25, 26, 28 and 29 are rejected under 35 U.S.C. §102 in view of U.S. Patent No. 5,151,227 ("*Nguyen*"). Further, the Patent Office alleges that claims 21, 27, 28, and 30-37 are rejected under 35 U.S.C. §103 in view of *Nguyen* and U.S. Patent No. 5,279,739 ("*Pemawansa*"). Thus, the Patent Office relies on *Nguyen*, alone or in combination with *Pemawansa*, in support of the rejections.

Of the pending claims at issue, claims 19, 22, and 32 are the sole independent claims. Claim 19 recites a melt-spun polysulfone semipermeable membrane. The melt-spun polysulfone semipermeable membrane consists essentially of a polysulfone compound and a solvent for the polysulfone compound wherein the melt-spun polysulfone semipermeable membrane has a homogeneous structure such that the melt-spun polysulfone semipermeable membrane has a substantially uniform pore structure throughout a thickness of the melt-spun polysulfone semipermeable membrane.

Claim 22 recites a polysulfone semipermeable membrane defined by a composition consisting essentially of a mixture of a polysulfone compound, a solvent for the polysulfone compound and a non-solvent for the polysulfone compound. The mixture has been melt-spun thereby allowing a homogeneous structure to be formed such that the polysulfone semipermeable membrane has a substantially uniform pore structure throughout a thickness of the polysulfone semipermeable membrane.

Claim 32 recites a polysulfone semipermeable membrane having a substantially uniform pore structure throughout a thickness dimension thereof. The polysulfone semipermeable membrane is constructed from a melt-spun composition that consists essentially of a polysulfone compound, a solvent for the polysulfone compound, and a non-solvent wherein the solvent includes tetramethylene sulfone, antipyrine,  $\delta$ -valerolactam, diethyl phthalate, and mixtures thereof.

Applicants have surprisingly discovered polysulfone semipermeable membranes that have a uniform pore structure useful for liquid separation, such as micro-filtration, ultra-filtration, reverse osmosis, dialysis and the like. See, specification, page 6, lines 11-15. The

semipermeable membranes of the present invention are made from uniquely discovered melt-spun technology. See, specification, page 1, lines 5-7. This contrast conventional membrane fabrication techniques, such as solution-spinning techniques that can require large amounts of solvents and non-solvents and further are generally known to produce asymmetric membranes that have a non-homogeneous porosity that progresses through a thickness dimension of the membrane. See, Specification, page 3, lines 3-15. Applicants have provided a number of illustrative examples that demonstrate, for example, the desirable permeability characteristics of the homogeneously-structured polysulfone membranes of the claimed invention. See, Specification, pages 7-25.

In contrast, Applicants believe that the cited art is deficient with respect to the claimed invention. With respect to the anticipation rejection, the Patent Office relies on *Nguyen* as previously discussed. Applicants believe that *Nguyen* fails to disclose or suggest at least a number of features as claimed.

For example, nowhere does *Nguyen* disclose or suggest a melt-spun polysulfone semipermeable membrane with a homogeneous structure that includes a substantially uniform pore structure throughout a thickness thereof as required by the claimed invention. At the outset, the primary focus of *Nguyen* relates to membranes that are made with solution spinning techniques (i.e., liquid-liquid or wet spinning process) contrary to the Patent Office's position. See, *Nguyen*, for example, col. 3, lines 7-9; col. 6, lines 35-36. Indeed, Applicants have recognized that membranes made from conventional processes, such as solution spinning processes (i.e., *Nguyen*), typically employ large quantities of solvents and non-solvents and further have an asymmetric structure as previously discussed.

Further, *Nguyen* provides that polymers or prepolymers in addition to polysulfone polymers can be used. See, *Nguyen*, col. 3, lines 43-45. For example, *Nguyen* discloses that polymers or prepolymers are added to the polysulfone polymer in order to modify the structure and surface characteristics of the polysulfone membrane. The additional polymer or prepolymer becomes an integral part of the membrane structure. See, *Nguyen*, col. 3, line 65 to col. 4, line 2. Moreover, the examples in *Nguyen* each disclose a membrane that includes a polysulfone compound in addition to PVP as an additional polymer. See, *Nguyen*, Examples 1-3. This

contrasts the melt-spun composition that consists essentially of a polysulfone compound, a solvent and optionally a non-solvent as claimed.

As even admitted by the Patent Office, *Nguyen* is deficient with respect to the specific type of solvents as required by the claimed invention. In this regard, NMP is the preferred solvent as disclosed in *Nguyen*. See, col. 4, lines 39-40; see also Examples 1-3. Moreover, the solvent in *Nguyen* is used in amounts that preferably range from about 60 wt% to about 80 wt%, such as 75 wt%, 73 wt% and 72 wt%. See, *Nguyen*, col. 4, lines 40-42 and Examples 1-3. Clearly, this suggests that *Nguyen* requires the use of higher amounts of solvent and thus lesser amounts of polysulfone compound as compared to the claimed invention, such as wherein the melt-spun composition includes about 30 to about 38 percent by weight of the polysulfone compound as recited in claims 31 and 37. Indeed, the preferred amount of polysulfone in *Nguyen* ranges from 9.0 to 18.0 wt%. See, *Nguyen*, col. 4, lines 43-45.

Based on at least these differences, Applicants believe that the solution spinning membranes as disclosed in *Nguyen* are deficient with respect to the melt-spun membranes as claimed that display desirable permeability characteristics as previously discussed. Therefore, Applicants believe that *Nguyen*, on its own, fails to disclose or suggest the claimed invention.

Further, Applicants do not believe that the Patent Office can rely solely on *Pemawansa* to remedy the deficiencies of *Nguyen*. In this regard, the Patent Office merely relies on *Pemawansa* for its purported teachings regarding the use of solvents and non-solvents for polysulfone in a polysulfone membrane. Indeed, Applicants have submitted the Affidavit of Dr. Shmuel Sternberg ("*Sternberg Affidavit*") in Applicants' response to the Office Action dated December 7, 2001. The *Sternberg Affidavit* is re-submitted herewith as Exhibit 1 for convenience. Applicants note that the *Sternberg Affidavit* is being re-submitted without Exhibits A and B referenced therein as Exhibit A and B were previously submitted.

As set forth in the *Sternberg Affidavit*, the *Pemawansa* patent (i.e., '739 patent) does not disclose or suggest a melt-spun process. Nor would the *Pemawansa* patent disclose or suggest to one skilled in the art the production of a symmetric membrane. See, Exhibit 1, ¶7. Clearly, this suggests that *Pemawansa*, like *Nguyen*, is at least deficient with respect to a melt-spun polysulfone semipermeable membrane that has a substantially uniform pore structure throughout a thickness of the melt-spun semipermeable membrane as required by the claimed invention.

What the Patent Office has done is to rely on hindsight reasoning in support of the obviousness rejection. Of course, this is not the proper analysis for patentability purposes.

Based on at least these noted reasons, Applicants believe that the cited art is directed to membranes that have a different compositional and structural make-up as compared to the melt-spun polysulfone semipermeable membranes of the claimed invention. As previously discussed, claim 19 recites a melt-spun polysulfone semipermeable membrane that consists essentially of a polysulfone compound and a solvent, such as tetramethylene sulfone, antipyrine,  $\delta$ -valerolactam, diethyl phthalate, and mixtures thereof (claim 21), such that the membrane has a homogeneous structure with a substantially uniform pore structure throughout a thickness thereof. Claim 22 recites a polysulfone membrane defined by a mixed composition that consists essentially of a polysulfone compound, a solvent and a non-solvent that has been melt-spun to provide a homogeneous structure as claimed. Further, claim 30 recites that the polysulfone compound is composed of bisphenol A polysulfone; the solvent is composed of sulfolane; and the non-solvent is composed of poly(ethylene glycol). As further defined in claim 31, the melt-spun composition includes about 30% to about 38% by weight of the polysulfone compound. Moreover, independent claim 32 recites a polysulfone semipermeable membrane with a substantially uniform pore structure throughout a thickness dimension thereof wherein the membrane is constructed from a melt-spun composition that consists essentially of a polysulfone compound, a solvent as claimed and a non-solvent. As further defined, the solvent and non-solvent are present in a ratio of about 2.5:1 to about 4.5:1.

In view of same, Applicants believe that one skilled in the art would consider that the claimed invention and the cited are clearly distinguishable. Therefore, Applicants respectfully submit that the *Nguyen* and *Pemawansa*, even if combinable, fails to anticipate and render obvious the claimed invention.

Accordingly, Applicants respectfully request that the rejections under 35 U.S.C. §102 in view of *Nguyen* and under §103 in view of *Nguyen* and *Pemawansa* be withdrawn.

In the Office Action, claims 19, 20, 22, 23, 24, 25, 26, 28 and 29 are rejected under 35 U.S.C. §102 in view of U.S. Patent No. 4,970,034 ("*Ly*"). The Patent Office essentially asserts that *Ly* teaches each and every feature of the claimed invention as defined in claims 19, 20, 22, 23, 24, 25, 26, 28 and 29.

Applicants believe that this rejection is improper. Of the pending claims at issue with respect to this rejection, claims 19 and 22 are the sole independent claims. As previously discussed, claim 19 recites a melt-spun polysulfone semipermeable membrane that, in part, has a substantially uniform pore structure throughout a thickness of the melt-spun polysulfone semipermeable membrane; and claim 22 recites a polysulfone semipermeable membrane that includes, in part, a melt-spun composition allowing a homogeneous structure to be formed such that the polysulfone semipermeable membrane has a substantially uniform pore structure throughout a thickness of the polysulfone semipermeable membrane.

In contrast, the primary emphasis of *Ly* relates to membranes that are made with solution spinning techniques (i.e., liquid-liquid or wet spinning process) contrary to the Patent Office's position. See, *Ly*, for example, column 6, lines 5-15. As previously discussed, Applicants have recognized that membranes made from conventional processes, such as solution spinning processes (i.e., *Ly*), typically utilize higher amounts of solvents and non-solvents and further have an asymmetric structure in contrast to the melt-spun polysulfone semipermeable membranes as claimed.

Further, *Ly*, like *Nguyen*, provides that polymers or prepolymers in addition to polysulfone compounds can be utilized to make the membranes. See, *Ly*, for example, column 3, lines 15-17 and lines 37-41. This contrasts the claimed melt-spun polysulfone composition that consists essentially of a polysulfone compound and a solvent (See, claim 19) and also can include a non-solvent (See, claim 22). Moreover, the cited reference discloses the use of different types of solvent in higher amounts and thus the use of the polysulfone compound in lesser amounts than as required by the claimed invention. Indeed, the preferred solvent in *Ly* is NMP. See, *Ly*, column 5, lines 6-8. Most preferably, this is used in an amount from about 50 to 70 weight percent (See, *Ly*, column 5, lines 41-43) wherein the polysulfone compound is preferably used in an amount from about 9.0 to about 18.0 weight percent. See, *Ly*, column 4, lines 7-9. This contrasts the claimed invention, such as the polysulfone semipermeable membrane that includes at least about 25% by weight of the polysulfone compound as recited in claim 25.

Based on at least these differences, Applicants believe that *Ly* is deficient with respect to the melt-spun polysulfone semipermeable membranes as claimed. Therefore, Applicants respectfully submit that *Ly* fails to disclose or arguably suggest the claimed invention.

Accordingly, Applicant respectfully request that the rejection of claims 19, 20, 22, 23, 24, 25, 26, 28 and 29 under 35 U.S.C. §102 in view of *Ly* be withdrawn.

For the foregoing reasons, Applicants respectfully submit that the present application is in condition for allowance and earnestly solicit reconsideration the same.

Respectfully submitted,

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